

WHAT IS CLAIMED IS:

1 1. A method for making micromechanical structures having at
2 least one lateral gap therebetween, the method comprising:
3 providing a substrate;
4 surface micromachining the substrate to form a first micromechanical
5 structure having a first vertical sidewall and a sacrificial spacer layer on the first
6 vertical sidewall;
7 forming a second micromechanical structure on the substrate, the
8 second micromechanical structure including a second vertical sidewall separated
9 from the first vertical sidewall by the spacer layer; and
10 removing the spacer layer to form a first lateral gap between the first
11 and second micromechanical structures.

1 2. The method as claimed in claim 1 wherein the step of surface
2 micromachining further forms a third vertical sidewall on the first micromechanical
3 structure with the sacrificial spacer layer thereon and wherein the method further
4 comprises forming a third micromechanical structure including a fourth vertical
5 sidewall separated from the third vertical sidewall by the spacer layer and wherein
6 the step of removing further forms a second lateral gap between the first and third
7 micromechanical structures.

1 3. The method as claimed in claim 1 wherein the second
2 micromechanical structure includes an electrode.

1 4. The method as claimed in claim 3 wherein the first
2 micromechanical structure includes a resonator and wherein the first lateral gap is
3 an electrode-to-resonator capacitive gap.

1 5. The method as claimed in claim 1 wherein the step of forming
2 includes the step of plating metal on the substrate and wherein the second
3 micromechanical structure is a plated metal electrode.

1 6. The method as claimed in claim 5 further comprising
2 preventing metal from being plated on the first micromechanical structure.

1 7. The method as claimed in claim 1 wherein the first lateral gap
2 is a submicron gap.

1 8. A micromechanical device comprising:
2 a substrate;
3 a first micromechanical structure supported on the substrate and
4 having a first vertical sidewall;
5 a second micromechanical structure supported on the substrate and
6 having a second vertical sidewall; and
7 a first submicron lateral gap between the first and second vertical
8 sidewalls to increase electromechanical coupling of the first and second
9 micromechanical structures.

1 9. The device as claimed in claim 8 wherein the second
2 micromechanical structure comprises an electrode.

1 10. The device as claimed in claim 9 wherein the electrode is a
2 metal electrode.

1 11. The device as claimed in claim 10 wherein the metal electrode
2 is a plated metal electrode.

1 12. The device as claimed in claim 8 wherein the first
2 micromechanical structure is a lateral resonator.

1 13. The device as claimed in claim 8 wherein the first
2 micromechanical structure has a third vertical sidewall and wherein the device
3 further comprises a third micromechanical structure supported on the substrate and
4 having a fourth vertical sidewall and a second submicron lateral gap between the

5 third and fourth vertical sidewalls to increase electromechanical coupling of the first
6 and third micromechanical structures.

1 14. The device as claimed in claim 12 wherein the lateral
2 resonator is a polysilicon resonator.

1 15. The device as claimed in claim 12 wherein the lateral
2 resonator is a flexural-mode resonator beam.

1 16. The device as claimed in claim 8 wherein the substrate is a
2 semiconductor substrate.

1 17. The device as claimed in claim 16 wherein the semiconductor
2 substrate is a silicon substrate.

1 18. The device as claimed in claim 8 wherein the first submicron
2 lateral gap is a capacitive gap.

1 19. The device as claimed in claim 13 wherein the second and
2 third micromechanical structures are electrodes.

1 20. The device as claimed in claim 19 wherein the electrodes are
2 metal electrodes.

1 21. The device as claimed in claim 20 wherein the metal
2 electrodes are plated metal electrodes.

1 22. The device as claimed in claim 13 wherein the first and second
2 submicron lateral gaps are capacitive gaps.

1 23. The method as claimed in claim 3 wherein the step of forming
2 includes the step of growing the electrode via selective epoxy growth.

1 24. The method as claimed in claim 3 wherein the step of forming
2 includes the steps of depositing polysilicon and etching the polysilicon to form the
3 electrode.

1 25. The device as claimed in claim 9 wherein the electrode is a
2 polysilicon electrode.

1 26. The device as claimed in claim 9 wherein the electrode is an
2 SEG-grown electrode.